MONTHLY PROGRESS

AND

FINAL REPORT

NAS9-5689

FOR

NASA MANNED SPACECRAFT CENTER
HOUSTON 1, TEXAS

October and November 1966

Covering

Design, Development and Delta Qualification
of the
Single Bridgewire Apollo Standard Initiator

Report No. PR-6174

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1.0 MONTHLY PROGRESS REPORT

This report is submitted to NASA Manned Spacecraft Center to satisfy the contractual requirements for a Monthly Progress and Final Report for work accomplished under NASA Contract Number NAS9-5689 during the reporting period from October, 1966 through 21 November 1966.

This report consists of a resume of work accomplished during the reporting period and a summary of the over-all program.

During this reporting period the test data generated in the course of the Qualification Test was reduced and checked for accuracy and completeness. The Qualification Test Report was then prepared, edited and six copies were reproduced. These copies were forwarded to NASA as soon as they were completed. The Qualification Report would normally have been the Final Report for the Single Bridgewire Apollo Standard Initiator Program if the task had not been expanded to include three lots of production hardware and additional Next Using Device Tests.

The three production lots of hardware, lots UAA, UAB and UAC have all been completed and delivered to the designated locations.

The drawings on NASA format of the detail parts, sub-assemblies and assemblies of the SBASI have been completed, checked for accuracy during the reporting period and the vellums forwarded to NASA.

The Next Using Device Tests were completed during this reporting period and the data is included in the Appendix of this report.

This report, in addition to being the Monthly Progress Report for the months of October and November, 1966, is also the Final Report for the Single Bridgewire Apollo Standard Initiator Program. All activities of the program have been reported in either the individual Monthly Progress Reports, the Interim Report or the Qualification Test Report. This includes the activities which have taken place during Phases V and VI of the program.

2.0 PHASES

2.1 Phases I, II and III

The first three phases covered primarily the design and development activities of the SBASI Program. These phases covered numerous areas of design and development effort. The majority of these tasks were completed either on schedule or prior to the scheduled date for completion.

All of the accomplishments of the development activity have been reported in concise detail in the various Monthly Progress Reports and were summarized in the April Combined Monthly Progress and Interim Report. Consequently, no additional reporting coverage on these phases is required.

2.2 Phase IV

This phase of the program encompassed performance testing, overpressurization tests and Next Using Device testing. The performance and overpressurization tests were completed and results were covered in the preceding Monthly Progress Report.

The Detonator, the Type I Cartridge, the Type II Cartridge and the Type 200 Cartridge firings have all been completed and the test results were included in previous reports. The Igniters, the Grumman Nut Cartridges, Grumman Bolt Cartridges and the End Detonating Cartridge firings were completed during this reporting period. The performance of the units using the SBASI was comparable to performance of units that used the four pin ASI. The results of these Next Using Device Tests are included in the Appendix.

2.3 Phase V

Phase V was made up of the pre-production fabrication and pre-production test portions of the program. This phase included the normal non-destructive testing, the 1 amp-1 watt no-fire tests, the 96 hour low temperature test, temperature cycling tests, all of the Bruceton testing, high and low temperature vibration testing and functioning of the units at high, low and ambient temperatures.

2.4 Phase VI

This phase included the fabrication of the qualification lot of hardware, lot acceptance testing prior to qualification and finally the performance of the Qualification Test Program.

The Qualification Test Program was started during the previous reporting period. The climatic, handling and storage, the mission sequential maximum level tests and the firings were completed during the month of September. The results of the Delta Qualification Test Program were excellent and the unit is now considered qualified to the requirements of the NASA work statement and qualified for use on the Apollo System either on the basis of similarity to the Four Pin ASI or on the successful completion of the Delta Qualification Test Program.

Compilation of the Qualification Test Report was started during the September reporting period and was completed during this reporting period. Six copies of the Qualification Test Report were forwarded to NASA/MSC during the month of October.

3.0 OVER-ALL PROGRESS

3.1 Progress to Date

The progress of the Single Bridgewire Apollo Standard Initiator Program has been most impressive to date since the entire program has essentially been on an accelerated basis.

The schedule was maintained throughout the earlier portions of the program but required adjustment when some of the long lead time items were not delivered on time. The adjustments that were made were phased in such a manner that the detrimental effects were minimized.

The one major schedule adjustment required was the Delta Qualification Test Program. This was necessary because of the added time required for the fabrication of the additional lots of qualification hardware. But here again, due to the extra effort expended, the time periods required were held to an absolute minimum and the Qualification Test Firings were completed within a few weeks of the original target date.

The three production lots of two hundred each were started as soon as it was expedient. All three lots, UAA, UAB and UAC, have successfully passed Lot Acceptance Testing and have been re-configured and shipped per NASA direction.

The drawings of the SBASI on NASA vellums were completed during the early part of November. These drawings reflect the unit which successfully completed the Qualification Test Program and is now in production. The drawings reflect the processes and materials used for the manufacturing of the SBASI and when used in conjunction with SKB26100053

represent a complete data package. The SKB26100053 Specification and the Test Specifications covering the Lot Acceptance and Qualification Test Program (TP 6005) have been previously submitted to NASA. The Specification Control Drawing SLB26100052 had also been submitted and approved by NASA/MSC. This drawing was updated to reflect the Qualification Test unit configuration during the reporting period and returned to NASA/MSC with the other vellums.

The completion of the Next Using Device Tests was the last remaining item on this program. Results of these tests are included in the Appendix.

APPENDIX

P.O. NO. NASS-5689

CONTR. NO. ---

CUSTOMER NASA

SPACE ORDNANCE SYSTEMS, INC.

DATA SHEET

NEXT USING DEVICE TESTS - IGNITER

JOB NO. 8023 LOT NO. DAD

REPORT NO.

DATE NOTED

AMBIENT TEMP. 76°F

PHOTO.

TEST MEDIUM

TEMP. +150°F & +20°F

PART NO. INITIATOR P/N 501-0197-11 ; IGNITER P/N 501-922-4 501-922-6

SPEC. PER TEST REQUEST & TP 5009

PARA. 4.7

S/N NOTED

MANUFACTURER	
INSTRUMENTATION	
S/N	
RANGE	
RATED	

MEMBER NUMBER INITIATOR CODE	SERIAL	LOT	FIRING CURRENT (AMPS)	TEMP (°F)	INITIATION TIME MILLISECONDS		START PRESSURE RISE TO PEAK MILLISECONDS		PEAK PRESSURE Pri PSI	PEAK PRESSURE Sec PSI	DATE
10202	0314	DAD	3.5	+20	2.9	—*	0.45	—*	2075	—*	11-3-66
	0331				2.6	2.7	0.8	1.0	2175	2000	
	0334				2.0	2.0	0.5	0.3	2050	1975	
	0310				2.7	2.9	0.9	1.0	2150	2050	
	0321				3.0	3.1	0.3	0.4	2250	2300	
	0300				2.2	2.2	0.5	1.0	2150	2175	11-3-66
	0301				2.1	2.2	0.7	1.0	2225	2350	11-4-66
	0308				3.5	3.8	1.0	1.1	1975	1975	11-4-66
	0293			+20	2.9	3.0	0.4	0.2	1925	1925	11-7-66
	0315			+150	2.9	3.0	0.5	0.7	2075	2225	
	0331				2.9	2.9	0.5	0.8	2175	2275	
	0311				2.8	2.9	0.6	0.2	2200	2325	
	0329				2.5	2.6	0.6	0.5	2200	2250	
	0335				2.6	2.6	2.0	1.8	2150	2125	
	0330				2.9	2.9	0.6	0.7	2250	2400	
	0319				4.0	—*	0.9	—*	2250	—*	
	0333				3.2	3.2	0.9	1.0	2200	2325	
	0305		3.5		3.0	—*	0.6	—*	2000	—*	
	0317		22.0	+150	0.5	0.6	0.8	0.9	2075	2100	
10002	0338	DAD	22.0	+20	0.3	0.3	1.7	1.5	2400	2475	11-7-66

NOTES: * LOST SECONDARY DATA DUE TO SHIFT IN PRESSURE ZERO.

SPECIMEN FAILED

SPECIMEN PASSED

F.R. WRITTEN

ING. EX. FORM C

TESTED BY G. Sessions

WITNESS

APPROVED BY

SHEET NO. OF

P.O. NO. NAS9-5689

CONTR. NO.

CUSTOMER NASA

SBASI NUT CARTRIDGE

SPACE ORDNANCE SYSTEMS, INC.

DATA SHEET

JOB NO. 8023 LOT NO. BKL

REPORT NO.

DATE 11-17-66, 12-15-66

AMBIENT TEMP. 70 ± 10°F

PHOTO.

TEST MEDIUM

TEMP. +180°F & -20°F

PART NO. SOS7-10240-62

SPEC. T.P. 6043

PARA. 5.4 NC

S/N Noted

MANUFACTURER	
INSTRUMENTATION	
S/N	
RANGE	
RATED	

MEMBER NUMBER CODE	SERIAL	LOT	CIRCUIT RESISTANCE OHMS	INITIATION TIME MILLISECONDS		START PRESSURE RISE TO PEAK MILLISECONDS		PEAK PRESSURE PSI	PEAK PRESSURE PSI	REMARKS
10002	105	BKL	1.17	1.1	1.1	1.1	1.2	6100	6000	+180°F 5.0 A
	110		1.21	0.9	1.0	0.9	0.9	6100	6000	
	109		1.17	0.9	0.9	1.0	1.1	6000	5800	
	108		1.14	0.9	1.0	1.1	1.1	6100	6000	
	107		1.24	1.0	1.1	1.1	1.1	6200	6000	
	112		1.11	1.1	1.1	1.4	1.6	6500	6200	
	114		1.16	1.6	1.6	1.3	1.3	6300	6200	
	113		1.20	0.9	0.9	1.0	1.1	6100	6000	
	111		1.24	0.9	0.9	1.0	1.1	6000	6000	
	122		1.20	1.0	0.9	1.0	1.0	6400	6200	+180°F
	115		1.07	1.2	1.2	1.0	0.8	6400	6000	-20°F
	* 120		1.04	—	1.0	—	0.5	—	6300	
	116		1.01	1.2	1.2	0.8	0.8	7200	6800	
	117		1.10	1.0	1.0	0.7	1.0	7000	6500	
	118		1.09	1.2	1.2	0.6	0.8	7000	6600	
	119		1.13	1.0	0.9	1.1	1.2	6900	6500	
	103		1.07	1.2	1.2	0.8	1.2	6600	6200	
	101		1.12	1.0	1.0	0.7	0.8	6900	6500	
	106			1.2	1.1	0.7	0.8	6900	6400	
10002	124	BKL	1.09	1.0	1.0	1.0	0.9	6800	6500	-20°F 5.0 A

NOTES: * NO DATA DUE TO BAD FILM

SPECIMEN FAILED

SPECIMEN PASSED

F.R. WRITTEN

TESTED BY

WITNESS

APPROVED BY

SHEET NO. OF

P.O. NO. NAS9-5639

CONTR. NO.

CUSTOMER NASA

SBASI Bolt Cartridge

PART NO. S07-10240-63

SPEC. T.P. 6043

PARA. 5.4 BC

S/N Noted

SPACE ORDNANCE SYSTEMS, INC.

DATA SHEET

JOB NO. 8023 LOT NO. BKK

REPORT NO.

DATE 11-18-66, 12-15-66

AMBIENT TEMP. 70 ± 10° F

PHOTO.

TEST MEDIUM

TEMP. -20°F + +180°F

MANUFACTURER	
INSTRUMENTATION	
S/N	
RANGE	
RATED	

MEMBER NUMBER CODE	SERIAL	LOT	CIRCUIT RESISTANCE OHMS	INITIATION TIME MILLISECONDS		START PRESSURE RISE TO PEAK MILLISECONDS		PEAK PRESSURE PSI	PEAK PRESSURE PSI	REMARKS	
10002	118	BKK	1.07	1.2	1.2	0.4	0.3	22 000	22 000	-20°F	5.0 A
	125		1.02	1.4	1.4	0.4	0.4	23 000	23 000		
	120		1.10	1.1	1.1	0.3	0.3	21 500	22 250		
	117		1.07	1.1	1.1	0.3	0.3	22 750	23 250		
	119		1.06	1.2	1.2	0.2	0.2	21 500	22 500		
	116		1.02	1.3	1.3	0.2	0.2	22 750	22 750		
	113		1.06	1.1	1.1	0.3	0.3	22 250	22 500		
	114		1.10	1.0	1.0	0.3	0.3	22 000	22 000		
	112		1.05	1.2	1.2	0.3	0.3	23 750	23 750		
	124		1.09	1.1	1.1	0.2	0.2	22 500	21 300	-20°F	
	115		1.15	1.2	1.2	0.3	0.3	21 750	21 000	+180°F	
	107		1.11	1.2	1.2	0.3	0.4	22 250	21 500		
	110		1.13	1.2	1.0	0.2	0.3	23 500	22 250		
	106		1.09	1.2	1.2	0.3	0.4	22 000	21 500		
	111		1.16	1.0	1.0	0.4	0.3	22 000	21 000		
	109		1.14	1.2	1.2	0.3	0.3	22 750	21 750		
	108		1.22	1.1	1.1	0.3	0.4	22 000	21 250		
	105		1.26	1.1	1.1	0.3	0.3	23 250	22 000		
	104		1.21	1.0	1.0	0.3	0.3	22 000	21 250		
10002	121	BKK	1.24	1.1	1.1	0.2	0.2	21 900	21 900	+180°F	5.0 A

NOTES:

SPECIMEN FAILED

SPECIMEN PASSED

F.R. WRITTEN

TESTED BY

WITNESS

APPROVED BY

SHEET NO. OF

P.O. NO. NAS 9-5689

CONTR. NO. N/A

CUSTOMER NASA

END DETONATOR

PART NO. SQ15-1019S-3.9

SPEC. TP 6024

PARA. 4.6.1 & 4.6.2

S/N NOTED

SPACE ORDNANCE SYSTEMS, INC.

DATA SHEET

JOB NO. 8023 LOT NO.

REPORT NO.

DATE 9-30-66

AMBIENT TEMP. +70°F ±10°F

PHOTO.

TEST MEDIUM

TEMP. NOTED

MANUFACTURER	
INSTRUMENTATION	
S/N	Functional Requirements: Plate Penetration = 0.018 in Min.
RANGE	
RATED	

MEMBER NUMBER CODE	SERIAL	LOT	DENT BLOCK MEASUREMENTS BRY Para S.C.	Cond. Temp. °F	FIRING CURRENT		REMARKS
529			.020	-150	5.0	(AMPS)	
535			.023	+200	3.5		
532			.021	+200	3.5		
528			.022	-150	5.0		
536			.022	+200	3.5		
533			.024	+200	3.5		
522			.023	-150	5.0		
534			.022	+200	3.5		
525			.025	-150	5.0		
530			.024	-150	5.0		
537			.023	+200	3.5		
526			.021	-150	5.0		
524			.023	-150	5.0		
527			.024	-150	5.0		
538			.022	+200	3.5		
523			.025	-150	5.0		
531			.022	-150	5.0		
539			.023	+200	3.5		
540			.023	+200	3.5		
542			.024	+200	3.5	(AMPS)	

NOTES:

SPECIMEN FAILED

SPECIMEN PASSED

TESTED BY W. Schaer

WITNESS

APPROVED BY

SHEET NO. OF